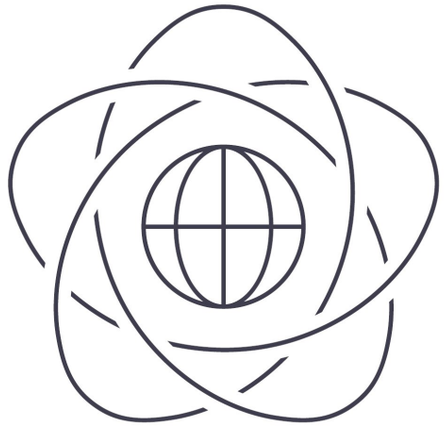


Case Studies 2022L

Ceteris Paribus profiles

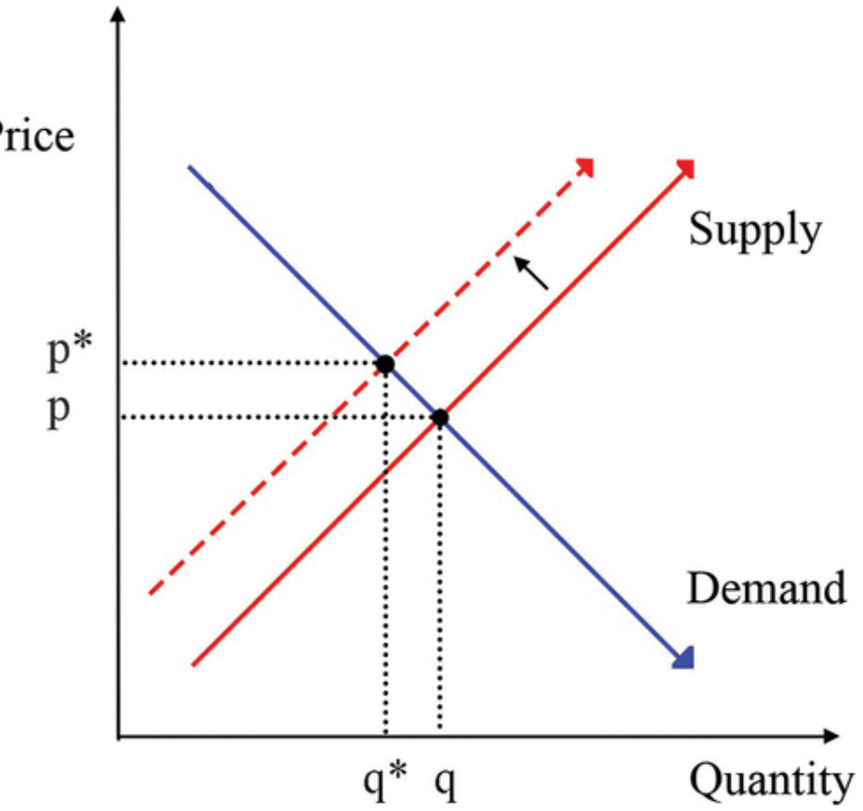
Mar 31, 2022

Ceteris-Paribus

Ceteris-paribus means all other things held constant.

Factors that can impact inflation rate:

- cost of production
- prices of goods
- demand for goods
- skill labor availability
- new technology
- current money supply
- …



Ceteris-Paribus Profiles

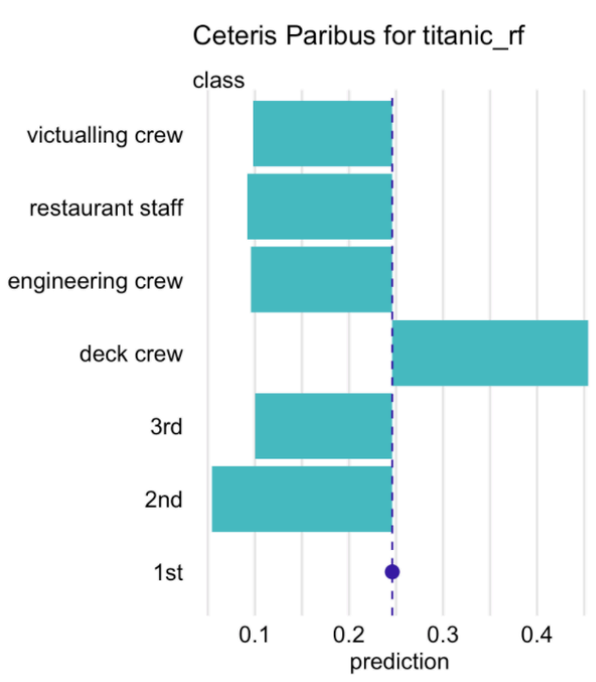
- This method is based on the ceteris-paribus principle.
- Ceteris Paribus (CP) profiles are designed to show model response around a single point in the feature space.
- The main goal is to understand how changes in the values of the variable affect the model's predictions.
- The CP profile is a kind of tool known as "What-if" (how a model's prediction would change if the value of a single exploratory variable changed) explainer.

Ceteris-Paribus Profiles

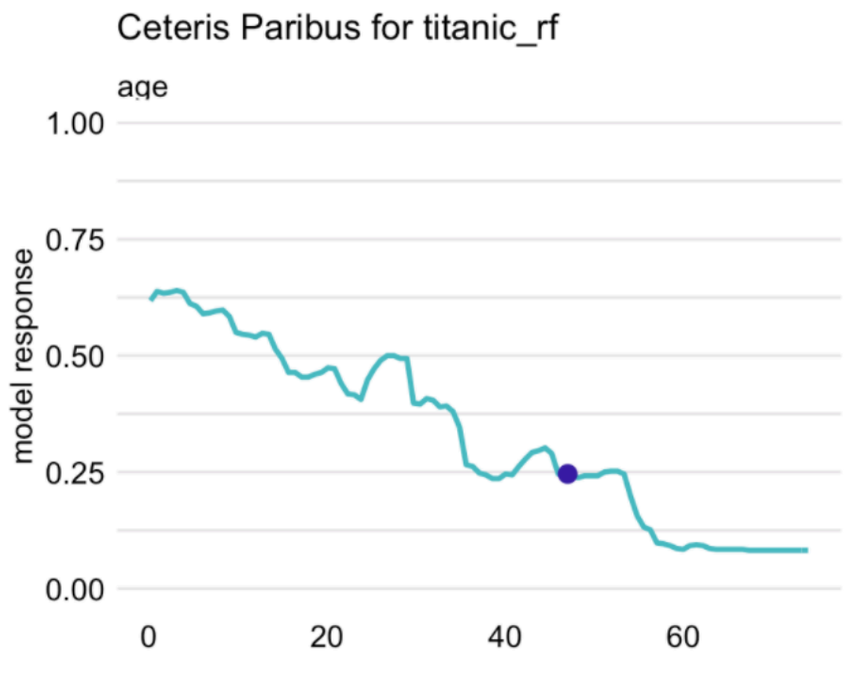
A one-dimensional CP profile *h()* for model *f()*, the *j*-th explanatory variable, and point of interest *x* as follows:

$$h_x^{f,j} = f(x^{j|z})$$

CP profile is a function that describes the dependence of the conditional expected value of *Y* on the value *z* of the *j*-th explanatory variable. In practice, *z* assumes values from the entire observed range for the variable, while values of all other explanatory variables are kept fixed at the values specified by *x*.



A) CP for categorical variable

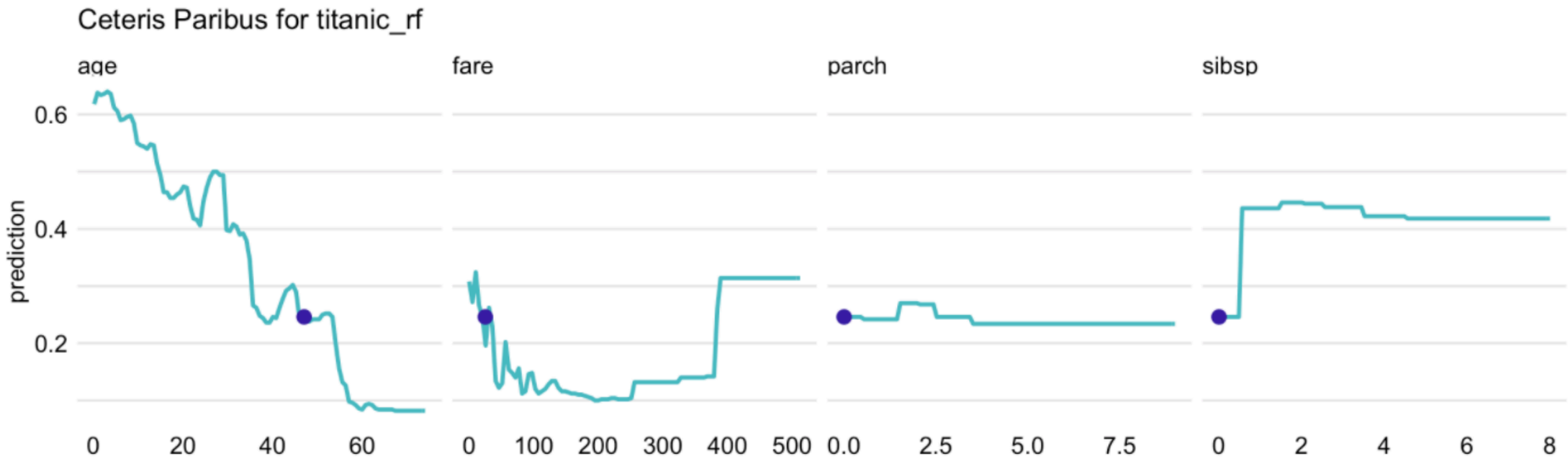


B) CP for continuous variable

blue dot
observed value of the observation for the variable

Ceteris-Paribus Profiles

The ML models contain a large number of variables, the CP profiles are legible even for tiny subplots:



sibsp: number of siblings/spouses aboard
parch: number of parents/children aboard

Pros and Cons

+ graphical representation is easy to understand and explain.

+ easy to compare for two or more models to better understand difference between the models.

+ compare two or more instances to better understand model-prediction's stability.

- presence of correlated explanatory variables may lead to misleading results. Because it is not possible to keep one variable fixed while varying the other one.

- the presence of interactions in a model.

- the number of plots to inspect may be daunting in case of a model with hundreds and thousands of variables.

Please feel free to send e-mail about your questions!

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